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COMPARATIVE STUDY OF VARIOUS RECONSTRUCTIVE PROCEDURES FOLLOWING DISTAL GASTRECTOMY FOR CA STOMACH

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CERTIFICATE

This is to certify that this dissertation entitled **"COMPARATIVE STUDY OF VARIOUS RECONSTRUCTIVE PROCEDURES FOLLOWING DISTAL GASTRECTOMY FOR CA STOMACH "** is bonafide work done by **Dr.J.INDUJA** under our guidance and supervision in the Department of surgery, Madurai Medical College, Madurai submitted for the M.S.,(General surgery) BRANCH I EXAMINATION, to be held in March 2008, by the Tamilnadu DR.M.G.R. Medical university, Chennai.

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CONTENTS

ABBREVIATIONS

BI - Billroth I

HF - Hofmeister – Finsterer

P - Polya

Br - Braun

RY - Roux – enY

WI - Wound Infection

DBO - Duodenal Blow Out

DGE - Delayed Gastric Emptying

AL - Anastomotic Leak

BV - Bilious Vomiting

D - Dumping

BRG - Bile Reflux gastritis

ESO - Esophagitis

A/E - Afferent & Efferent loop obstruction

RS - Roux Stasis

MA - Malabsorbtion

INTRODUCTION

Carcinoma of stomach has been described as one of the captain of men of death. It is the second most common cancer in developing countries. Gastric cancer is an eminently curable disease provided that it is detected at an appropriate stage and treated adequately.

In U.S.A and U.K, there is a fall in incidence of Gastric Carcinoma along with rising incidence of Adeno Carcinoma of the Cardia.

Tumor is epidemic in Japan with an incidence of 70 per 1 lakh males, cumulative risk by age of 75 years of 11 %. Screening and radical surgical resections helped adequate staging and improved survival rates in Japan. Out side of Japan Ca. Stomach is usually at an advanced stage by the time of diagnosis, with infiltration beyond the submucosa, into or through the gastric wall.

To a patient, diagnosis of Ca.Stomach often signifies impending death. Fortunately there have been recent rapid advances in science and earlier diagnosis of this disease, which is encouraging for the future.

Gastrectomy is a common surgery performed even by amateur surgeons and the best method of reconstructions of GI continuity remains an enigma.

AIM OF STUDY

The aim of study is to find out

= To compare between different reconstructive procedures used at GRH, to establish GI continuity after partial resection of stomach as a palliative or curative measure.

= Post operative morbidity and mortality

REVIEW OF SURGICAL ANATOMY

ANATOMICAL RELATIONSHIPS

Most of the stomach is in the left upper quadrant of abdomen. The GE junction is normally 3 to 4 cm below the diaphragmatic esophageal hiatus in the horizontal plane of the 7th

chondrosternal articulation. The left lateral segment of liver usually covers a large portion of stomach anteriorly. The remainder is bounded by the diaphragm, chest and abdominal wall. The stomach is related inferiorly to the transverse colon, spleen, caudate lobe of liver, diaphragmatic crura and retroperitoneal nerves and vessels. The gastrosplenic ligament attaches the proximal greater curvature to the spleen.

BLOOD SUPPLY

Arteries: They are

1. The left gastric artery-from coelic axis
2. The right gastric artery-from common hepatic artery
3. The right gstroepiploic artery-from gastroduodenal artery
4. The left gastroepiploic artery from splenic artery
5. The short gastric arteries – from splenic artery

Veins of stomach

The veins of stomach mainly accompany the arteries. Of particular surgical importance is the left gastric or coronary vein, which receives branches from the esophagus.

Lymphatic drainage of stomach

The lymphatic drainage of stomach usually parallels the vasculature. The cardia and medial half of body drain to the left gastric nodes. The lesser curvature sides of distal antrum and pylorus drain to the right gastric nodes. The greater curvature half of the distal 60% of stomach drains into the rights gastroepiploic nodal chain, whereas the proximal greater curvature drains intothe left gastroepiploic chain. These four groups of nodes all drain to the Coeliac Nodes; from which lymph drains to the thoracic duct.

It is widely recognized that gastric cancer anywhere in the stomach may metastasize to any of the four nodal groups. The rich submucosal plexus of lymphatics is responsible for microscopic

evidence of malignant cells several centimeters from the margins of gross disease.

In Japan, the lymph node dissection is highly advanced and Japanese Research Society for gastric cancer has assigned a number to each LN station to aid in pathological staging.

Station Number	**LN description**	**Site of cancer**			
		Antrum	**Middle**	**Cardia**	**Cardia & oesophagus**
1	Right cardial	N2	N1	N1	N1
2	Left cardial	-	N1	N1	N1
3	Lesser curvature	N1	N1	N1	N1
4sa	Short gastric	N1	N1	N1	N1
4sb	Left gstroepiploic	N1	N1	N1	N1
4d	Right gstroepiploic	N1	N1	N2	N2
5	Supra pyloric	N1	N1	N2	N2
6	Infra pyloric	N1	N1	N2	N2

7	Left gastric	N2	N2	N2	N2
8a	Anterior hepatic artery	N2	N2	N2	N2
9	Coeliac	N2	N2	N2	N2
10	Splenic hilum		N2	N2	N2
11	Splenic artery		N2	N2	N2
12	Hepatic pedicle				
13	Retropancreatic				
14	Mesenteric root				
15	Middle colic artery				
16	Para aortic				

Lymphatic spread of carcinoma stomach is both by permeation and emboli to the affected tiers of nodes. This may be extensive, tumor appearing even in the supraclavicular nodes (Troisier's sign).

Nerve supply of stomach

The extrinsic innervation of stomach is both parasympathetic through the vagus and sympathetic through the celiac plexus (T5 to T10).

The intrinsic or enteric nervous system of the stomach consists of neurons in Auerbachs (myenteric) and Meissners (submucosal) autonomic plexus.

INCIDENCE

It remains the most common cause of death from malignant disease world wide. There is a great variation in incidence both internationally and nationally. In most countries Gastric Carcinoma incidence has been steadily declining during the past 40 years. Despite very large international differences in the incidence

of Gastric Ca, the male to female ratio shows little geographic variations. The sex ratio given for western world indicates the incidence of Gastric Ca, to be twice as high in men as in women.

The disease is seen most frequently between age 50 & 70 with a peak incidence of about 60 for both sexes. In a study the percentage of diffuse carcinoma decreased with increasing age, while incidence of intestinal type increased markedly upto 50 years. Carcinomas of proximal esophagogastric junction and fundic areas have increased significantly over last four decades from 21 to 44 % and this increase was accompanied by a significant decrease in antral carcinomas from 60 to 30 %.

PREDISPOSING FACTORS

= Pernicious anemia – 4 to 6 times that of general population.

= Previous Gastric Surgery for benign disease.

= Lower socio economic groups.

= Familial – Rare.

= Blood group A compared to Blood group O – 2 : 1

= Atrophic gastritis.

= High risk diet - Low in animal fat and proteins

High in complex Carbohydrates

Low in Salads, green leafy vegetables.

High in salt.

= Smoking and alcohol.

= Infection with H.Pylori – (Cag Agene +)

PREMALIGNANT CONDITIONS

1. Atrophic gastritis – Type A and Type B

Type A : Associated with pernicious anemia

Involves body and fundus, leaves antral

mucosa intact.

Auto immune in origin.

Type B : Involves primarily the antrum

Environmental in origin.

2. Intestinal Metaplasia

3. Dysplasia.

4. Gastric Polyps – Risk is highest in adenomatous polyps (38%)

PATHOLOGY OF CA.STOMACH

Adeno carcinoma comprises 95%, followed by Lymphoma, Carcinoid, Squamous cell ca and Sarcoma.

EARLY GASTRIC CANCER :

It is confined to mucosa and sub mucosa, irrespective of nodal status. EGC is divided based on endoscopic appearances.

Type I	:	Protruding type (thickness twice that of Normal mucosa)
Type II	:	Superficial type.
II a	:	Superficial elevated (thickness less than

twice that of normal mucosa)

II b : Superficial flat.

II c : Superficial depressed.

Type III : Excavated.

ADVANCED GASTRIC CANCER :

Borrmann classified the macroscopic appearance into five types.

Both Lauren and Mulligan proposed histogenetic systems of classification.

Borrmann classification :

Type I : Polypoid or Fungating cancer.

Type II : Ulcerative lesion with elevated borders.

Type III : Ulcerated lesion infiltrating gastric wall.

Type IV : Diffusely infiltrating tumors.

Type V : Unclassified cancers.

LAUREN CLASSIFICATION :

	Intestinal	**Diffuse**
1.	Environmental Gastric atrophy, Intestinal metaplasia.	Familial Blood type "A".
2.	Men > Women increasing incidence with age.	Women > Men Younger age.
3.	Gland Formation.	Poorly differentiated, signet ring cells.
4.	Hematogenous spread.	Transmural / Lymphatic Spread.
5.	Micro Satellite instability.	Decreased E cadherin.
6.	p 53, p 16 inactivation.	p 53, p 16 inactivation.

PATTERN OF SPREAD AND PROGNOSIS :

1) Direct Spread.

2) Lymphatic Spread.

3) Blood borne metastasis.

4) Transperitoneal / Transcoelomic.

Diffuse cancers may be expected to extend widely in the submucosa and individual cancer cells may be found several cms from the main tumor.

Margins of minimal clearance of 4cm are required for intestinal type & minimum of 8cm for diffuse ca.

Gross appearance, site and degree of local invasion of tumor all bear on prognosis, as do histologic features.

Size appears to be important prognostic factor : tumors < 4 cm are associated with better prognosis. The 5 yr prognosis for EGC is in excess of 90% in Japanese reports but as low as 60% in European reports. Regional lymph node invasion appears to be present in 60% of patients. Lymph node invasion is more prevalent

in carcinomas arising from proximal third compared with those arising from distal third. Overall 5 yr survival falls to 20% if lymph nodes are involved.

CLINICAL FEATURES

In Carcinoma stomach, definite symptoms do not usually occur until the tumor is large enough to obstruct the lumen, cause disordered gastric function by invading a large segment of the wall or bleeds.

Over 70 % of patients have had some symptoms for longer than 6 months before seeking advice. The most common symptom is vague indigestion, upper abdominal pain and dyspepsia. As the disease progresses it may cause anorexia, weight loss, nausea and melena. $1/4^{th}$ of patients will have history of gastric ulcer. Dysphagia is usually associated with tumors of the cardia or gastro esophageal junction. Gastric outlet obstruction is associated with

antral tumors and early satiety can be seen with diffusely infiltrating tumor.

Thus carcinoma stomach can have 3 types of presentation.

1. Insidious type.
2. Obstructive type.
3. Peptic ulcer type.

Physical findings consistent with metastatic disease include a palpable umbilical mass (sister Mary Joseph's node), palpable supra clavicular lymphnode (virchow's node), peritoneal implants in pelvis (Blumer's shelf) and an ovarian mass (krukenberg's tumor).

INVESTIGATIONS

The most common mode of diagnosing gastric ca is **endoscopy** which allows visualization and immediate biopsy of both tumors and non malignant processes. The diagnostic accuracy

of endoscopic biopsy is related to the number of biopsies taken per patient, the site of biopsy within the ulcer and tumor type.

Although markers such as CEA, CA 19 - 9, CA 72.4 and AFP can be abnormally increased in 15 to 60 % of patients, these markers are not specific for gastric ca.

STAGING MODALITIES :

Following diagnosis by endoscopy, patients may be assessed for extent of disease using

- Endoscopic ultra sound.
- CT Scan.
- PET Scan.
- Laparoscopy with Laparoscopic ultra sonogram sound.

Endoscopic ultra sound :

It provides key staging information, especially in superficial tumors and those located at GE junction. EUS estimates the depth of tumor invasion and extent of perigastric adenopathy. Accuracy of EUS for depth of invasion ranges from 60 to 90 %. It visualizes perigastric nodes > 3 m.m. in 70 % of cases.

CT Scan :

Abdominal and pelvic CT is most common staging tool for gastric Ca. CT accurately diagnoses locally advanced Ca in more than 95 % of patients and assesses liver metastasis in 85% of patients. CT is less reliable in diagnosing lymphnode metastasis.

PET Scan :

It is an investigational imaging tool with potential for detecting metastatic diseases and measuring response of the primary tumor to chemotherapy.

Laparoscopy with Laparoscopic ultra sonogram :

It is complementary to CT and EUS. Laparoscopy (Video assisted) helps detect occult metastatic disease not detected by other modalities in about 33 % of cases. It also detects peritoneal metastasis not detected by other modalities.

The Laparoscopic ultra sonogram uses a 7.5 Mhz transducer. It is superior in identifying unsuspected metastasis in the liver and lymphnodes.

STAGING

The International Union against cancer (UICC) Staging is given below :

T-PRIMARY TUMOR

Tx Primary Tumor cannot be assessed.

To No evidence of Primary Tumor.

Tis Carcinoma in situ, intraepithelial tumor without invasion of lamina propria.

T1a Limited to mucosa.

T1b Tumor invades submucosa.

T2a Tumor invades muscularis propria.

T2b Tumor invades Subserosa.

T3 Tumor invades serosa without invasion of adjacent structures.

T4 Tumor invades adjacent organs, tissues or both.

N Category (Regional lymph nodes)

Nx Regional lymph nodes cannot be assessed.

No No regional lymph nodes metastasis.

N1 Metastasis in 1 to 6 regional lymph nodes.

N2 Metastasis in 7 to 15 regional lymph nodes.

N3 Metastasis in more than 15 regional lymph nodes.

M - Distant Metastasis

Mx Distant metastasis cannot be assessed

Mo No distant metastasis

M1 Distant metastasis

Stage Grouping

Stage O	Tis	No	Mo
Stage IA	T1	No	Mo
Stage IB	T1	N1	Mo
	T2	No	Mo
Stage II	T1	N2	Mo
	T2	N1	Mo
	T3	N0	Mo
Stage IIIA	T2	N2	Mo
	T3	N1	Mo
	T4	N0	Mo
Stage IIIB	T3	N2	Mo
	T4	N1	Mo
Stage IV	T4	N2, N3	Mo

ANY T	N3	Mo
ANY T	ANY N	M1

JAPANESE SURGICAL STATING SYSTEM FOR

CARCINOMA STOMACH

Serosal involvement

S0: No serosal involvement

S1: Suspected serosal involvement

S2: Definite serosal involvement

S3: Adjacent organ involvement

Nodal involvement

N0: No nodes

N1: Perigastric lymph nodes

N2: Lymph nodes along left gastric artery, common hepatic artery, splenic artery, coelic axis

N3: Lymph nodes in hepatoduodenal ligament, posterior aspect of pancreas, root of mysentry

N4: Paraaortic and middle colic lymph nodes

Peritoneal involvement

P0: Peritoneal involvement

P1: Adjacent peritoneal involvement

P2: A few scattered metastasis to distant peritoneum

P3: Many distant peritoneal metastasis

Hepatic involvement

H0: No liver metastasis

H2: Metastasis limited to one lobe

H3: Numerous bilateral metastasis

Stage grouping

Stage I	:	S0	NO	PO	HO
Stage II	:	S1	N0	P0	H0
Stage III	:	S2	N0-2	P0	H0
Stage IV	:	S3	N3-4	P1-3	H1-3

TREATMENT

SURGICAL TREATMENT :

The optimal surgical management of gastric cancer must be tailored to the extent and location of disease. In the absence of distant metastatic spread, aggressive surgical resection of the gastric tumor is justified. Because gastric tumor are characterized by extensive intra mural spread, a line of resection of at least 6 c.m from the tumor mass is necessary to ensure a low rate of anastomotic recurrence.

Tumors of the cardia and proximal stomach account for 35 to 50%. They are more advanced on presentation and so curative resections are rare. For proximal lesion, either total gastrectomy or proximal gastric resection is necessary.

Distal tumors account for approximately 35 % of all gastric cancer. Since recent studies have indicated no difference in 5 year survival between patient under going potentially curative subtotal versus total gastrectomy, subtotal gastrectomy is appropriate for patients in whom a negative margin of resection can be performed.

The role of extended lymphadenectomy in the surgical treatment of gastric cancer remains controversial. Extended lymphnode dissection for the treatment of gastric cancer have been described by Japanese.

A D1 resection refers to the removal of group 1 lymphnodes.

A D 2 resection refers to the removal of groups 1 & 2 lymphnodes.

A D 3 stands for a D2 resection plus removal of para aortic nodes.

The grouping of lymphnodes is according to primary site of the tumor. To effect complete removal of station 10 (parasplenic) and station 11 (para pancreatic) nodes, Japanese surgeons perform splenectomy and partial pancreatectomy during D 2 resection for primaries whose drainage includes these echelons. Splenectomy is no longer advocated as a routine adjunctive procedure to gastrectomy for cancer.

TREATMENT OF EARLY GASTRIC CANCER :

1. Interventional flexible endoscopic treatment

   - Submucosal resection, photo dynamic ablations.

2. Laproendoluminal resection

3. Transgastrostomal endoscopic surgery

4. Laproscopic gastric resections.

TECHNIQUES OF ENDOSCOPIC MUCOSAL RESECTION :

1. Strip biopsy technique.

2. Aspiration mucosectomy.

3. EMR using ligating devices.

4. Photodynamic ablation.

PALLIATIVE TREATMENT :

The goal of palliative treatment is the relief of symptoms with minimal morbidity. Surgical palliation of advanced gastric cancer include resection or bypass alone or in conjunction with percutaneous, endoscopic or radio therapeutic techniques. In the presence of peritoneal disease, hepatic metastases, diffuse nodal metastases, or ascites, palliation of bleeding or proximal gastric obstruction would preferably be obtained non operatively. Non operative therapies include laser recanalization and endoscopic dilation with or without stent placement.

CHEMOTHERAPY :

Neoadjuvant Chemotherapy :

Patients with potentially resectable disease treated in phase II studies with pre-op CT, RT or both have shown a high response

rate and some have had pathologically negative resections specimens but there have not been any randomized trials published.

Systemic Adjuvant Therapy :

Adjuvant therapy with FAM regimen (5 – fluorouracil, Adriamycin and Mitomycin C) was considered most active but showed no evidence of improved survival over resection alone.

New Regimens

1. Cisplatin based regimen – response rate 40 % for advanced gastric cancer

    * EAP - Etopside

      Adriamycin (Doxorubicin)

      Cisplatin

2. FDP – 5 FU + Doxoubicin or Epirubicin + Cisplatin.

3. FTP – 5 FU + Doxoubicin + Triazinate.

Disadvantages of New Regimen is high toxicity

Intraperitoneal Adjuvant Therapy :

Because the resection site is the most common place for recurrence of gastric cancer, intraperitoneal Chemotherapy is being advocated in certain centres.

1. Perioperatively :

Intraperitoneal mitomycin 50 mg given in one trial from Japan was associated with significantly higher patients survival

2. Post Operatively :

Intraperitoneal cisplatin and 5 FU followed by systemic 5 FU or 5 FU and mitomycin is being evaluated.

The Chemotherapy regimen of epirubicin, cisplatin and continuous infusion 5 FU was recently shown to have superior activity and administered every 21 days for advanced disease.

RADIOTHERAPY :

Localized Disease :

RT (4,000 cGy in 4 weeks) in combination with 5 FU appears to improve survival over RT alone in patients with localized but unresectable cancers. Intraoperative radiation therapy (IORT) allows high doses of radiation to the tumor bed or residual disease while permitting exclusion of mobile radio sensitive normal tissues from the area irradiated but trials are limited.

Advanced Disease :

Gastric adenocarcinoma is relatively radio resistant and requires high doses of radiation with attendant toxic effects to surrounding organs. RT may be useful for palliating pain,

vomiting due to obstruction, gastric haemorrhage, and metastasis to bone and brain.

HISTORY OF GASTRIC SURGERY

Gastrectomy was attempted as early as 1879 by JULES PEAN of France and 1880 by LUDWIG VON RYDYGIER of Poland and they tried reconstruction by direct anastamosis using catgut to form a gastro duodenostomy. Both operations were un successful due to gastric leakage and peritonitis.

CHRISTIAN ALBERT THEODOR BILLROTH (1829 – 1894) performed the first recorded gastrectomy for gastric cancer in 1881. The procedure was done under chloroform using antiseptic precautions. Gastro duodenal anastamosis was done with carbolized silk. The patient survived for four months but died of recurrent disease.

WOLFER (Billroths Assistant) developed bypass gastroenterostomy to relieve gastric outlet obstruction in irremovable tumors.

In 1885 Billroth performed resection of distal stomach, and restored continuity by gastroenterostomy to the postr wall of the stomach. The patient survived for 18 months. Thus Billroth II operation was born.

HOFMEISTER in 1888 devised partial closure of the gastric stoma and Braun in 1892 formulated the use of the enteroenterostomy with a long afferent limb. SCHOEMAKER modified Billroth I technique by formation of a new lesser curvature.

ROUX devised the Y loop of Jejunum in 1898 and Polya devised the retrocolic anastomosis of the entire width of the gastric segment to the jejunum after gastrectomy, all in an attempt to overcome the complication and to attain near normal restoration of GI anatomy and function.

BILLROTH I GASTRECTOMY

Billroth partial gastrectomies consist of the removal of the distal portion of the stomach. The distal partial gastrectomy is named according to the type of anastomosis between the small intestine and the gastric remnant, regardless of the extent of the gastrectomy.

The Billroth I operation is a gastroduodenostomy, that can be preformed end-to-end or end-to-side, where the duodenal passage remains

intact. Because of anastamotic requirements, the Billroth I operation is, as a rule, performed as an antral or two-thirds gastrectomy.

The reconstruction of the gastroduodenal passage in the Billroth I operation has undergone numerous modifications. The endo-to-end anastomosis was performed as a posterior or anterior gastroduodenostomy, or the duodenal end was connected to the entire circumference of the cut-edge of the stomach. End-to side gastroduodenostomy was performed by anastomosing the stomach to the side of the duodenum opposite the major duodenal papilla or entirely below the level of the papilla. The technique most frequently used today is the schoemaker modification of the Billroth I with partial closure of stomach remnant along the lesser curvature and an inferior gastroduodenostomy.

Arguments in favoue of Billroth I :

Preservation of the duodenal passage

- Acids are neutralized in the duodenum by pancreatic and duodenal bicarbonate through neural and harmonal regulation. After distal stomach resection, this regulation is disturbed regardless of the type

of anastomosis. The value of duodenal passage is clearer with regard to the function of the pancreas, the changes in the stomach remnant and the function of the cardia.

- Pancreatic function is relatively undisturbed than gastrojejunostomy. Fat loss in faces is considerably less.

- Histologic changes of the stomach mucosa characteristic of chronic atrophic gastritis seem to be present to a lesser extent after Billroth I.

Indications

1. Gastric ulcer, usually a recurrent ulcer after adequate antisecretory and H.Pylori treatment .
2. Prepyloric ulcer.
3. Complicated ulcers – Intractable ulcers and large perforated ulcer.
4. Early carcinoma and carcinoma of antrum

Post operative complications :

1. Anastomatic leak (3% to 4%)
2. Bleeding (2%)

3. Passage disorders (2 to 5%)
4. Post operative pancreatitis (0.9%)
5. Chronic gastritis and brilious vomiting (80%)
6. Gastroesophageal reflux

Suture insufficiency can be managed conservatively, as long as the suture line dehiscence does not occur in first 3 or 4 days after surgery.

If gastric stasis is a problem, it usually is a consequence of anastomotic edema or a hematoma and resolves after 10 to 14 days.

Intragastric or intraperitoneal bleeding may require reoperation if more than 4 units of blood per 24 hrs are needed for replacement.

Postoperative pancreatitis is usually of edematous variety with relatively good prognosis.

BILLROTH II GASTRECTOMY

Any gastric resection in which the continuity is restored by closure of the first part of duodenum and anastomosis between the stomach and jejunum is known as Billroth II gastrectomy.

Indications

1. High gastric ulcer

2. Ulceration of antrum – benign (or) malignant
3. Bleeding, posterior, giant DU
4. Persistent, recurrent DU

Modifications of Billroth II

Polya's procedure

A type of posterior gastroenterostomy where resection of 2/3rd of stomach is done with blind closure of duodenal stump and retrocolic anastomosis of full circumference of open stomach to jejunum.

Hofmeister – Finsterer modification

Partial gastrectomy with closure of a portion of lesser curvature and retrocolic anastomosis of remainder to jejunum.

Braun's modification

Side to side anastomosis used to gastroenterostomy to avoid a circulus vitiosies and postoperative disturbance of passage.

Roux-enY gastrojejunostomy

The jejunum is divided, and closed distal end is brought side to end to the stomach, the anastomis between jejunum and stomach being fashioned in the same way as Billroth II. The proximal end of the jejunum is anastomosed end-to-side to the jejunum itself. The loop from the stomach to the jejunojejunostomy is 60cm in length and antecolic to the end of the stomach with a valve.

COMPLICATIONS OF GASTRECTOMY AND RECONSTRUCTION

Early complications

1. Wound infection
2. Duodenal blow out
3. Delayed gastric emptying
4. Anastomotic leak

5. Bilious vomiting

Delayed complications

1. Dumping syndrome
    - Early
    - Late
2. Bile reflux gastritis
3. Esophagitis
4. Afferent and Efferent loop obstruction
5. Roux stasis syndrome
6. Malabsorbtion

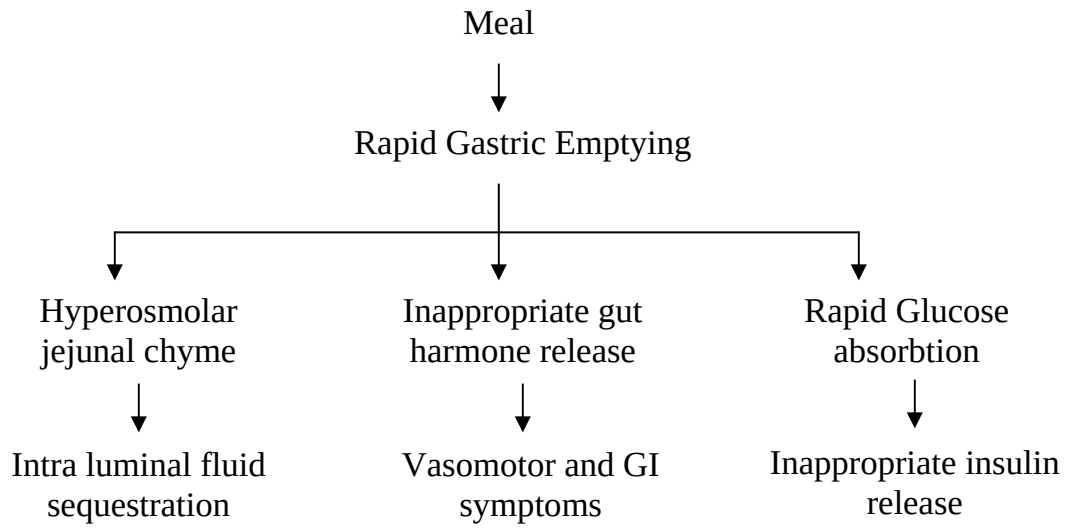
Post gastrectomy syndromes secondary to gastric resection

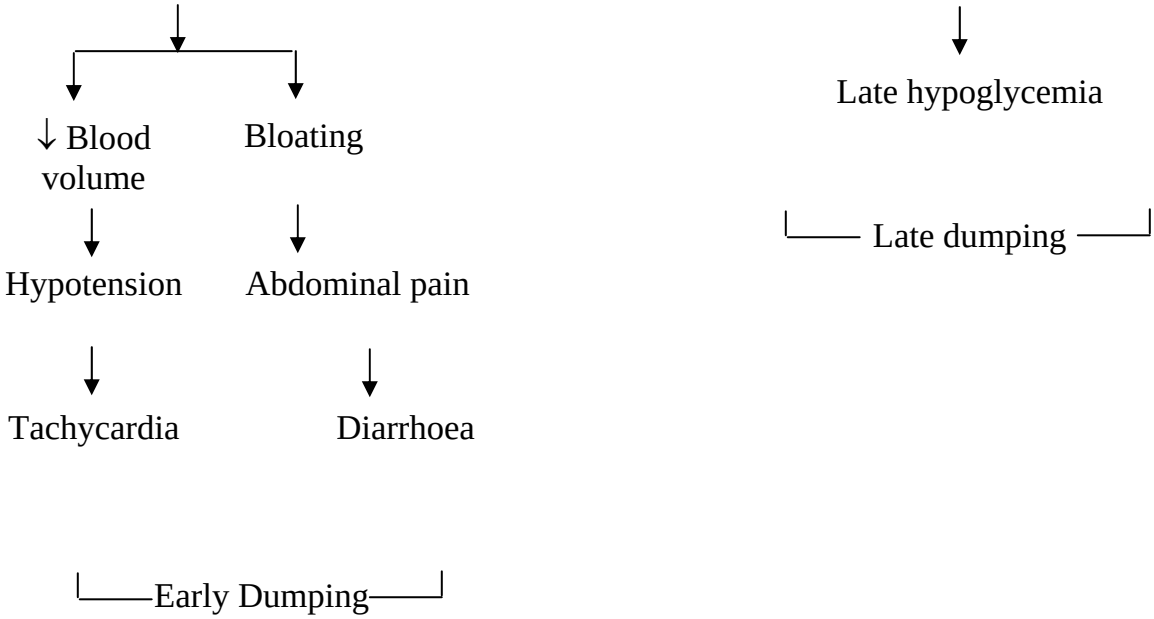
Dumping syndrome

It refers to a symptom complex that occurs following ingestion of a meal when a portion of the stomach has been removed or normal pyloric sphincter mechanism has been disrupted. Its classified into early and late forms, based on the timing and onset of symptoms after a meal.

Category	Onset after meal	Typical symptoms
Early	10-30 min	Post prandial fullness, crampy abdominal pain, nausea, vomiting explosive diarrhoea, diaphoresis weakness, dizziness
Late	2-3 hrs	Diaphoresis Weakness Dizziness Flushing Palpitation

Pathophysiology of dumping





Diagnosis

It is a clinical diagnosis that depends on presence of typical symptoms in a post gastrectomy patient.

Sigstad developed an objective index in an attempt to score the severity of symptoms in patients with dumping syndrome. The score is

helpful in studying patients with dumping and judging the success of therapy.

The visick grading system is also used to characterize the severity of symptoms and success of treatment.

Sigstad's clinical dumping score

Symptoms	Score
Shock	+5
"Almost fainting", syncope unconsciousness	+4
Desire to lie or sit down	+4
Breathlessness	+3
Weakness, exhaustion	+3
Sleepiness, drowsiness	+3
Palpitation	+3
Restlessness	+2
Dizziness	+2
Headache	+1
Feeling of warmth, sweating, pallor	+1

Nausea	+1
Fullness in abd, meteorism	+1
Borborygmus	+1
Eructation	-1
Vomiting	-4

Visick classification

I	No Symptoms
II	Symptoms relieved by care
III S	Symptoms not relived by care but satisfactory
III U	Symptoms not relieved by care and unsatisfactory
IV	Not improved

Medical treatment

1. Dietary fibres → Delay transit and slows carbohydrate absorbtion
2. Acarbose → Inhibits starch metabolism
3. Octreotide → Inhibits enteric peptide release

Delays gastric emptying
Inhibits jejunal fluid and glucose absorbtion
Inhibits insulin release

Surgical treatment

Initial Surgery	**Proposed conrection**
Billroth I & II	Roux- en Y GJ
Roux en Y GJ	Antiperistaltic jejunal segment

Metabolic disturbance

- The most common metablic defect following gastrectomy is anemia – due to iron deficiency and impairment in Vit B_{12} metabolism.
- Impaired fat absorbtion as a result of inadequate mixing of bile salts and pancreatic lipase with ingested fat.
- Calcium deficiency leading to osteoporosis and osteomalacia.

POST GASTRECTOMY SYNDROMES RELATED TO GASTRIC RECONSTRUCTION

Afferent loop syndrome:

- This occurs as a result of partial obstruction of the afferent limb that is unable then to empty its contents. The syndrome usually occurs when afferent limb is longer than 30 to 40 cm and has been anastomosed to gastric remnant in an antecolic fashion.

Causes

- Due to kinking and angulation of afferent limb.
- Internal herniation behind efferent limb.
- Stenosis of gastrojejunal anastomosis.
- Redundant twisting of afferent limb with volvulus
- 2° to adhesions involving afferent limb.

Following obstruction, accumulations of pancreatic and hepatobiliary secretion results in distension, causing epigastric discomfort. In setting of partial obstruction, bilious vomiting occurs. In complete obstruction, necrosis and perforation of the loop can occur. In cases of long standing obstruction, blind loop syndrome occurs.

The acute form of afferent loop obstruction may occur within a few days after surgery or may develop unexpectedly years after Billroth II. It

is caused by acute blockage of afferent limb requiring immediate surgical intervention.

Diagnosing chronic afferent loop obstruction is by means of x ray abdomen, contrast barium study or UGI endoscopy. Failure to visualize the afferent limb on endoscopy is suggestive of the diagnosis.

Treatment

For both forms, acute and chronic, surgery is indicated. A Billroth II reconstruction is converted into Billroth I or a Roux-en Y anastomosis is done with concomitant vagotomy.

Efferent loop obstruction

The most common cause is herniation of the limb behind the anastomosis in a right to left fashion. It may also compress the mesentry of afferent limb, compromising its blood supply. 50% of patients become obstructed within the first postoperative month.

Diagnosis is usually established by contrast barium study with failure of barium to enter the efferent limb.

Operative intervention is necessary and consists of reducing the retroanastomotic hernia and closing the retroanastomotic space.

Alkaline Reflux Gastritis

Following gastrectomy, biliary reflux is fairly common and associated with bilious vomiting and weight loss.

HIDA scans are usually diagnostic demonstrating biliary secretion into the stomach and even into esophagus in severe cases. UGI endoscopy can be performed, with multiple biopsies taken away from the stoma, and the gastric fluid can be analyzed for bile acid concentration. On endoscopy, the mucosa is friable and beefy red with superficial mucosal ulcerations.

Most patients have had gastric resection with Billroth II reconstruction. For patients with intractable symptoms, surgery is recommended. The surgical procedure of choice means converting the Billroth II anastomosis into Roux-en-Y gastrojejunostomy.

Roux limb syndrome

The characteristic complex of symptoms include nausea, vomiting, post prandial epigastric fullness and upper abdominal pain. The most important etiological factor, may be related to the associated vagal denervation that accompanies most gastric resections and subsequent loss of duodenal pacemaker.

MATERIALS AND METHODS

This study consists of 58 cases of carcinoma of distal stomach proved by endoscopy and biopsy who were taken up for distal gastrectomy either as curative or palliative procedure over a 2 year period June 2005 – August 2007.

The patients were randomized into groups based on the method of reconstruction used and followed up over a mean period of 1 year which varied from 6 months to 2 years. The immediate post operative mortality, short term and long term complications among the different groups were compared and analysed using careful clinical questioning regarding post gastrectomy symptoms and visick grading system.

The patients were examined in detail, investigated to study extent of the disease and co-morbid conditions, and prepared for surgery with special emphasis on nutrition and hydration and taken up for laporotomy. Thorough laporotomy was done with upper midline incision, and based on preoperative assessment of extent of the disease and perioperative findings, curative or palliative resection planned. Patients were closely followed up postoperatively until discharge. Patients were followed up at

weekly intervals for 6 weeks (adjuvant chemotherapy started) and monthly upto 6 months.

The Visick clinical grading system which was developed as a simple classification scheme for grading the outcome after gastric surgery was used.

The criteria taken into the grading system are post gastrectomy GI complaints like fullness, diarrhoea, dumping, malabsorbtion and gastritis and clinical failure as determined based on one or more of three criteria, namely disease recurrence, severe nutritional problems and severe post gastrectomy problems.

Patients graded as visick Grade I have no GI complaints, no clinical failure with an excellent outcome, those with Grade II had mild GI complaints, no evidence of clinical failure and a good outcome. Patients with Grade III had significant complaint, no or partial clinical failure and a fair outcome while patients with Grade IV had significant complaints demanding intervention, evidence of clinical failure with a poor outcome.

GI complaints	Clinical failure	Outcome	Visick grade
None	No	Excellent	Grade I
Mild	No	Good	Grade II
Significant	No or partial	Fair	Grade III
Significant	Yes	Poor	Grade IV

RESULTS OF THE STUDY AND DISCUSSION

Of the 58 patients, 20 had undergone relatively curative resection and 38 underwent palliative resection. They were followed up for variable intervals ranging from 6 months to 2 years with a mean follow up of 1 year. Early postoperative mortality was seen in 2 patients.

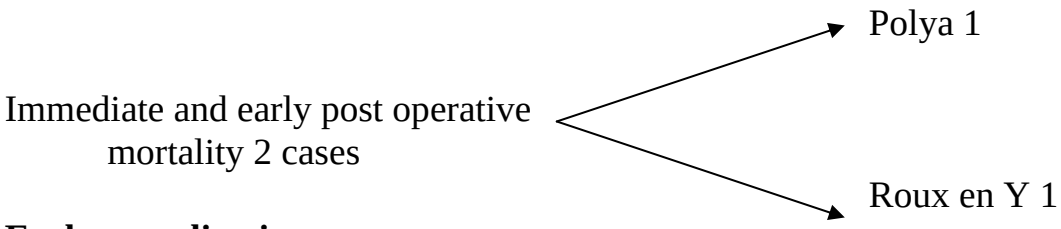
Polya - 1

Roux-en-Y - 1

Early complications were encountered in 27 patients and included wound infection, delayed gastric emptying which needed prolonged nasogastric aspiration and delayed oral feeding; bilious vomiting occurring within 2 weeks of surgery, anastomotic leak and blow out of duodenal stump. On analysis of the complications among the different groups, it may be seen that they are fairly evenly distributed among the different groups with almost similar proportions.

Type of reconstruction

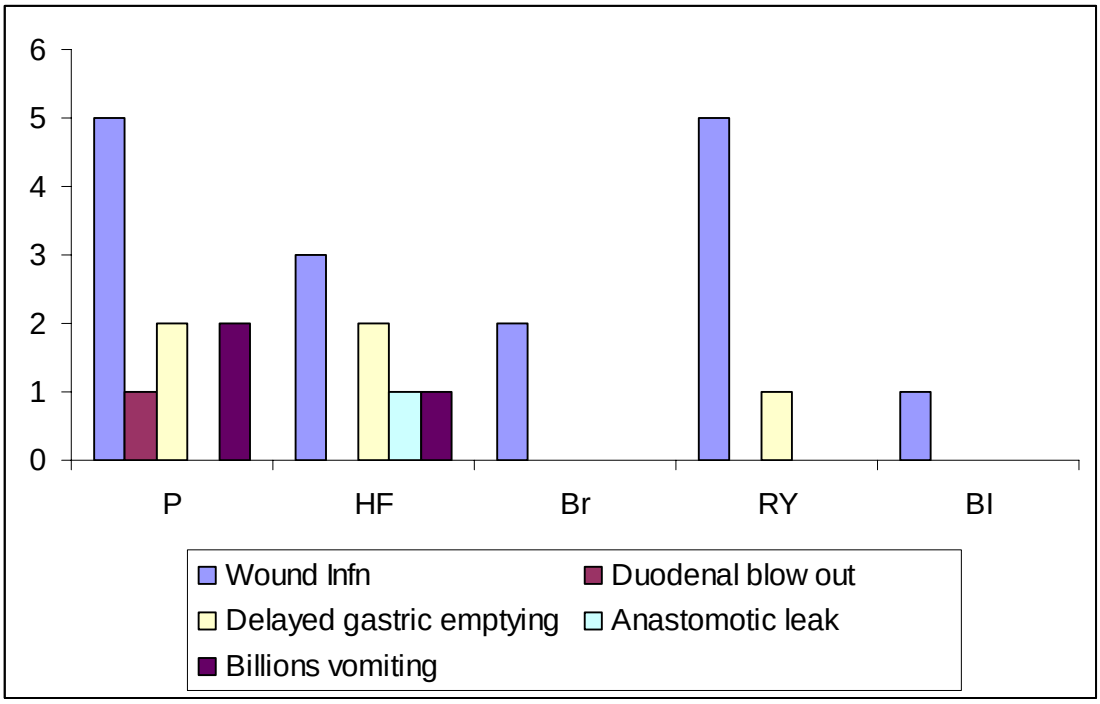
Type of reconstruction	Potentially curative	Palliative
Billroth I (BI	2	-
Polya (P)	5	13
Finsterer-Hoffmeister (HF)	8	8
Braun (Br)	3	7
Roux en Y (RY)	2	10
	20	38



Early complications

Complications	No. of cases	Type of Reconstruction				
		P	HF	Br	R-Y	BI
Wound Infection	16	5	3	2	5	1
Duodenal blow out	1	1	-	-	-	-
Delayed gastric emptying	5	2	2	-	1	-
Anastomotic leak	1	-	1	-	-	-
Bilious vomiting	4	2	1	-	-	1
		10	7	2	6	2

Chart



Delayed complications however showed a more uneven occurrence. Of the 17 patients who experienced dumping symptoms, 8 were from polya group and 4 from Hofmeister group.

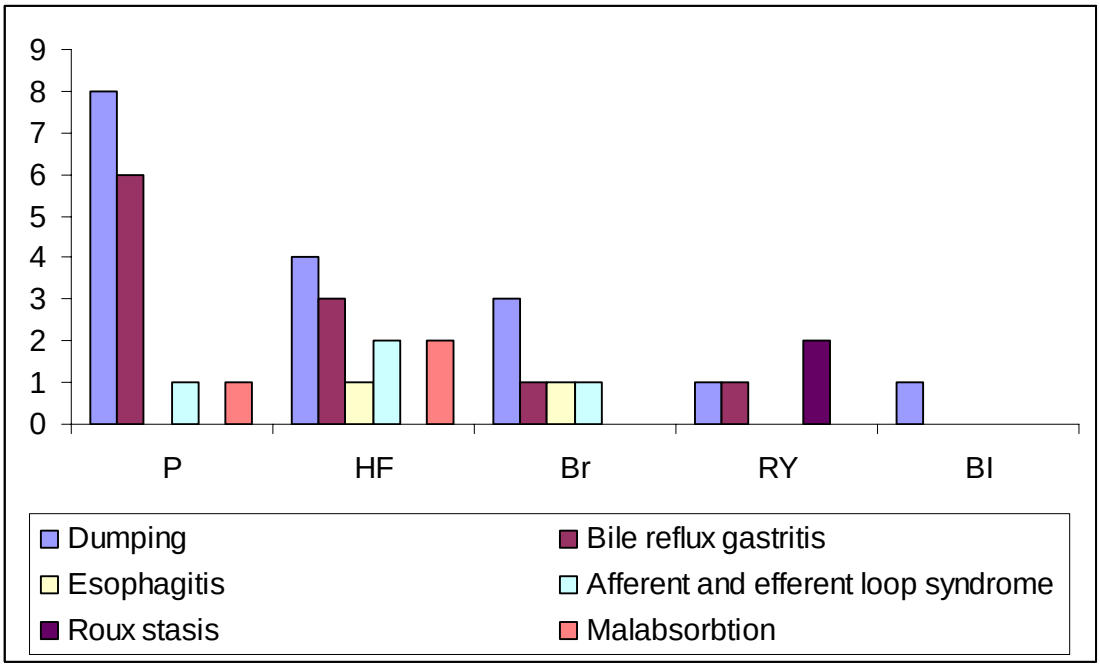
Of the 11 patients who experienced alkaline reflux gastritis, 6 belonged to polya and 3 from HF group.

Remaining complications like afferent and efferent loop obstruction, esophagitis, roux stasis and malabsorbtion were evenly distributed.

Delayed complications

Complications	No. of cases	Type of Reconstruction				
		P	HF	Br	RY	BI
Dumping	17	8	4	3	1	1
Bile reflux gastritis	11	6	3	1	1	-
Esophagitis	2		1	1	-	-
Afferent and efferent loop syndrome	4	1	2	1	-	-
Roux stasis	2	-	-	-	2	-
Malabsorbtion	3	1	2	-	-	-
	39	16	12	6	4	1

Chart



On grading of all our patients with visick scores, 24 came out with a Grade I, 20 with Grade II, 10 with Grade III and 4 with Grade IV, of the poorer grade more belonging to polya and Hofmeister groups.

Visick Grading	**Total**	**P**	**HF**	**Br**	**RY**	**BI**
I	24	4	7	4	9	0
II	20	6	6	5	2	1
III	10	6	2	0	1	1
IV	4	2	1	1	-	-
	58	18	16	10	12	2

On analysing the results using the normogram and standard error of proportions, early complications among the different groups were seen to be of no statistical significance while delayed complications graded with visick III and IV were statistically significant in Braun and polya group when compared with Roux-en-Y group.

CONCLUSION

The short term complications did not differ in a significant way among the different techniques of reconstruction after distal gastrectomy.

The immediate post op mortality was seen in 2 patients – one in the polya group and one in RY group, both due to anastomotic leak.

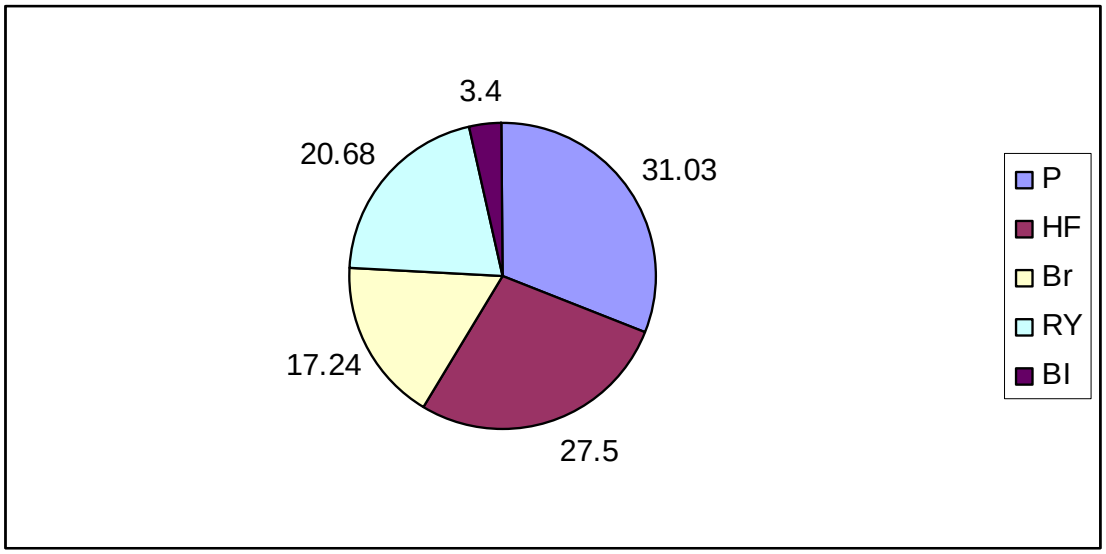
Long term complications were significantly higher in polya and HF gastrectomy compared to the Roux en Y and Braun technique. This difference was more significant especially with regard to bile reflux and dumping.

Limitations of this study are that it is a single centre analysis, all the surgeries were not done by a single surgeon.

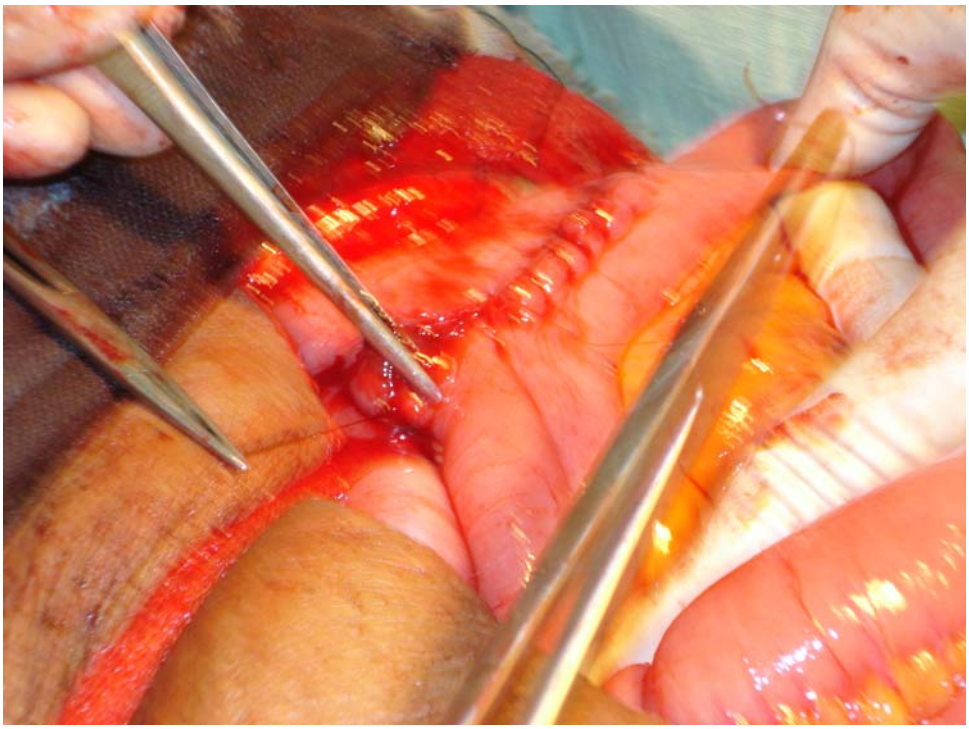
The number of Billroth I reconstruction were too small to show any statistical significance and further constraints faced during the procedure could not be taken into account.

In conclusion, Roux-en Y and Braun techniques have a lower long term complication rate and may be preferred method of reconstruction when technically feasible especially in patients expected to have a longer postoperative survival and when the resection is apparently curative.

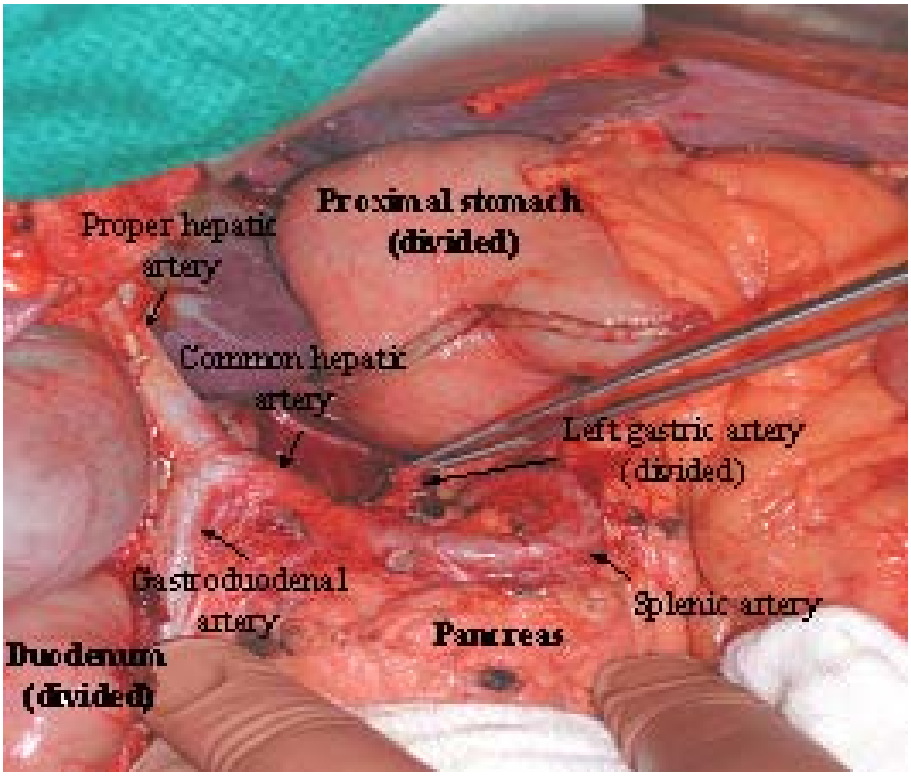
VISICK GRADING



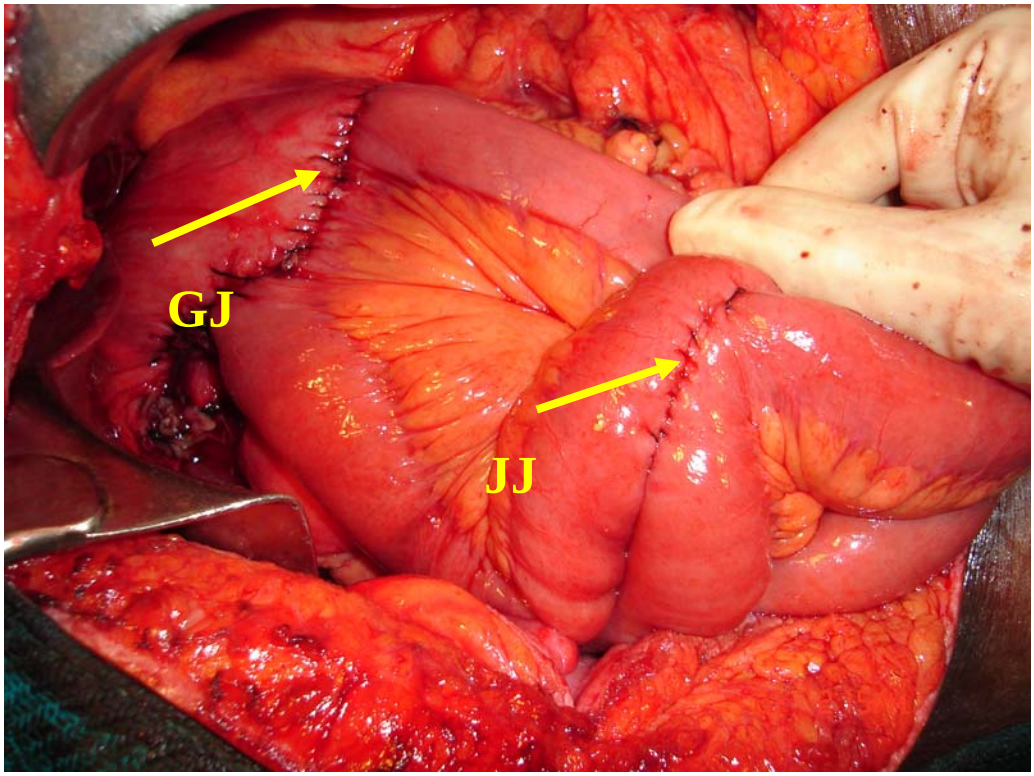
BILLROTH I



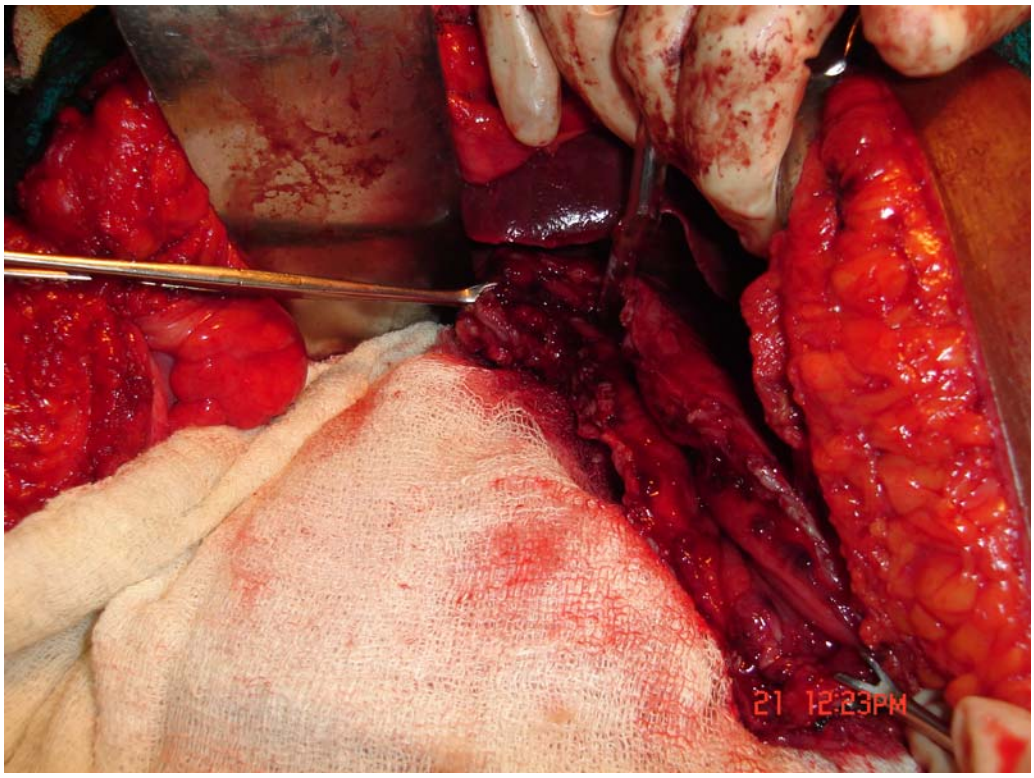
DISTAL GASTRECTOMY WITH D2 RESECTION



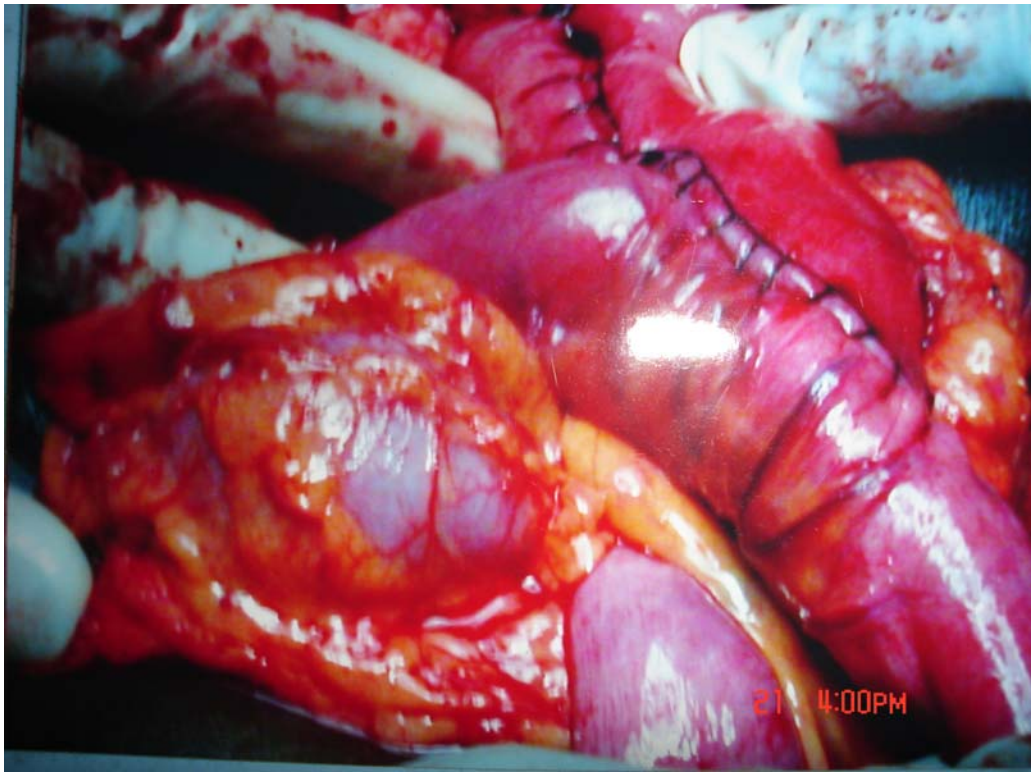
BRAUN'S GASTROJEJUNAL ANASTOMOSIS



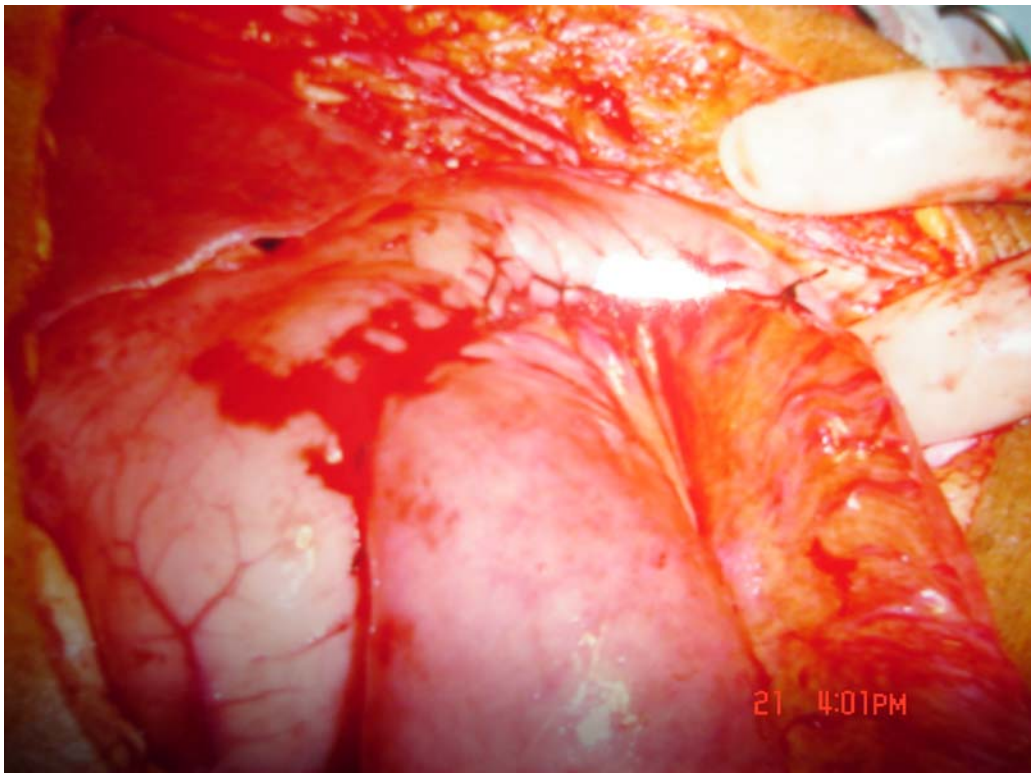
DISTAL GASTRECTOMY

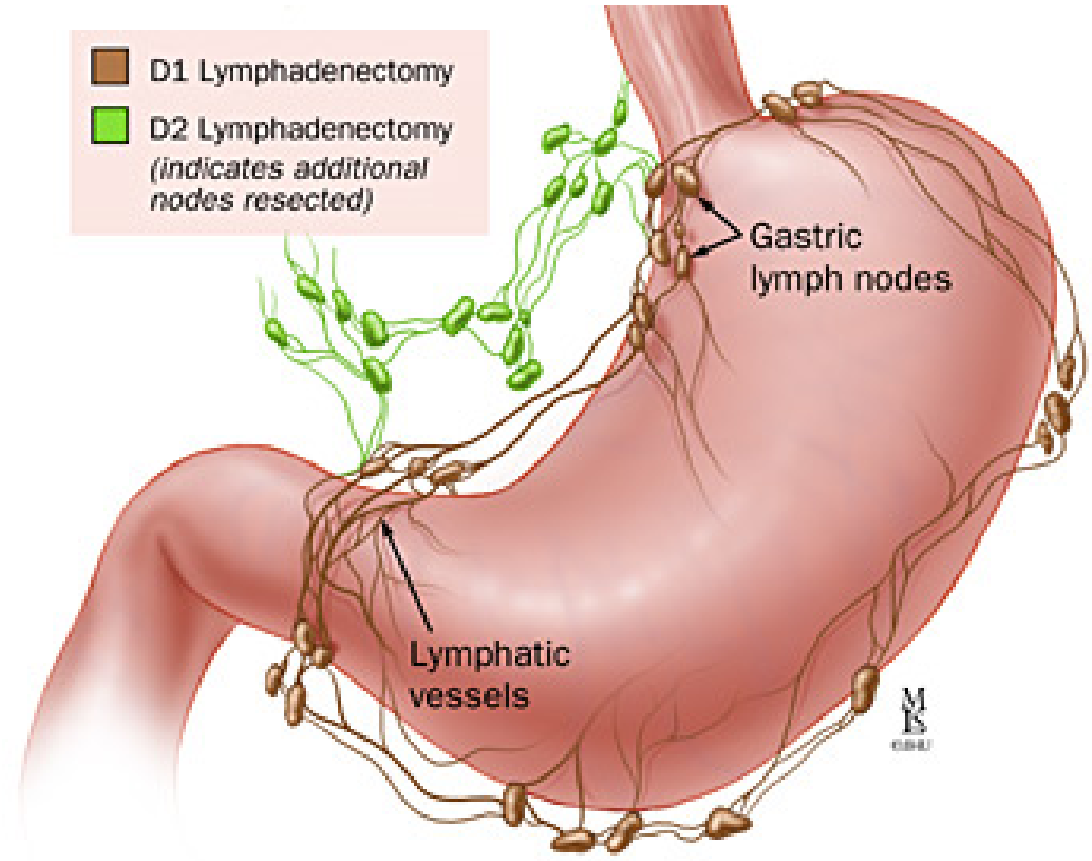


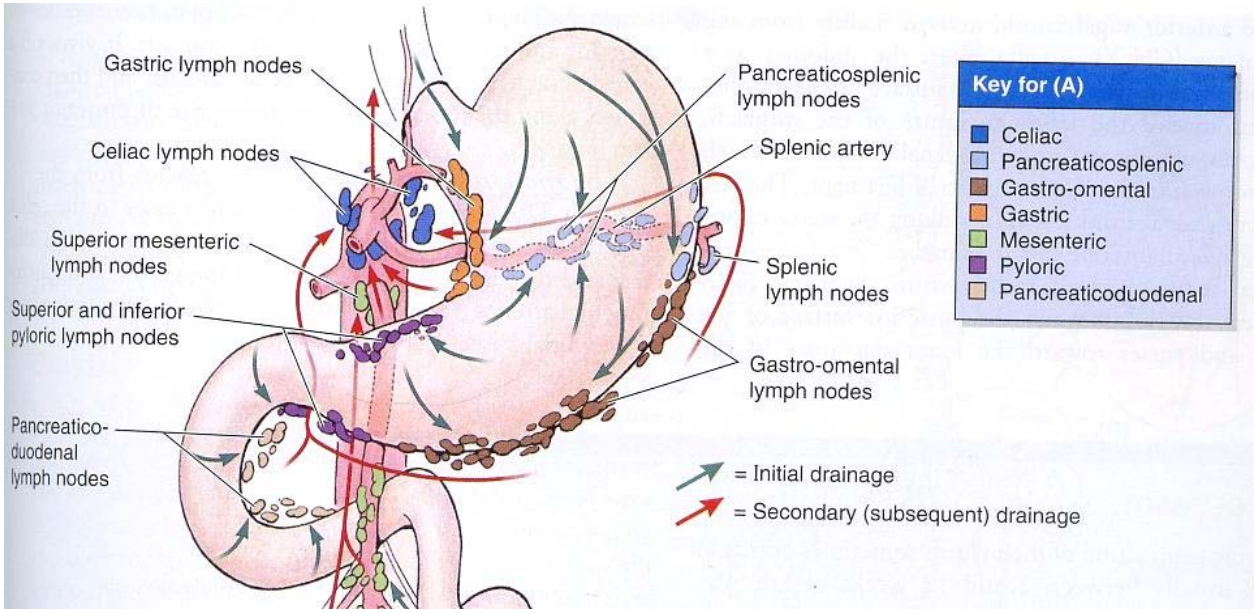
HOFMEISTER FINSTERR



POLYA

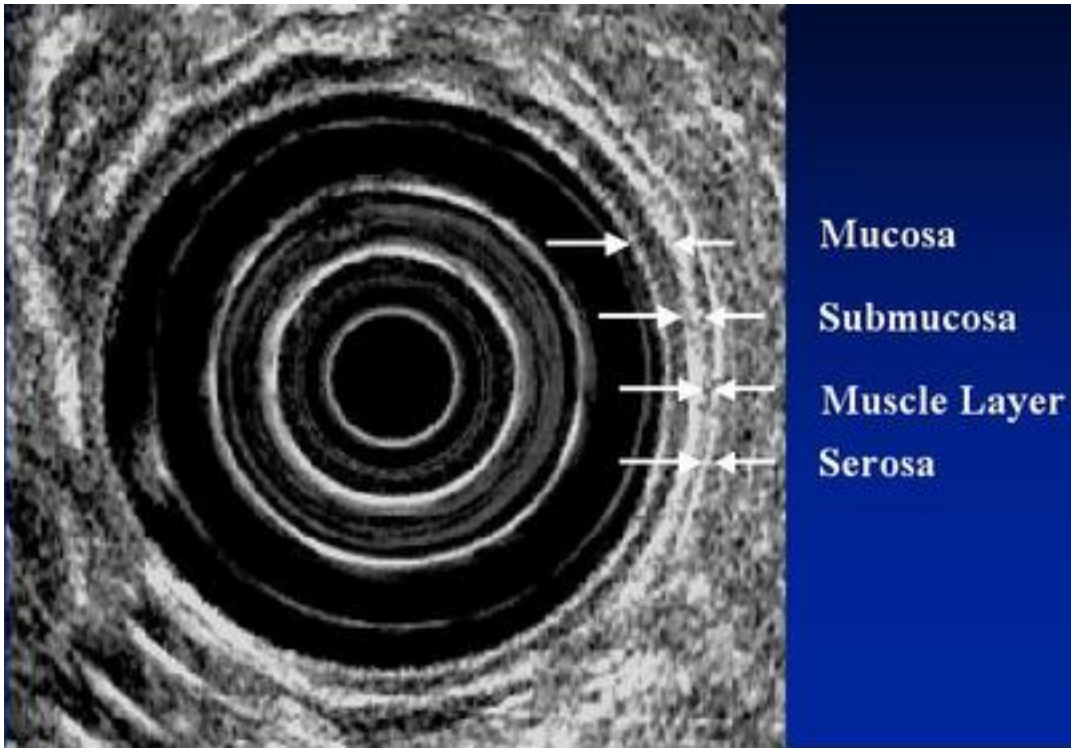






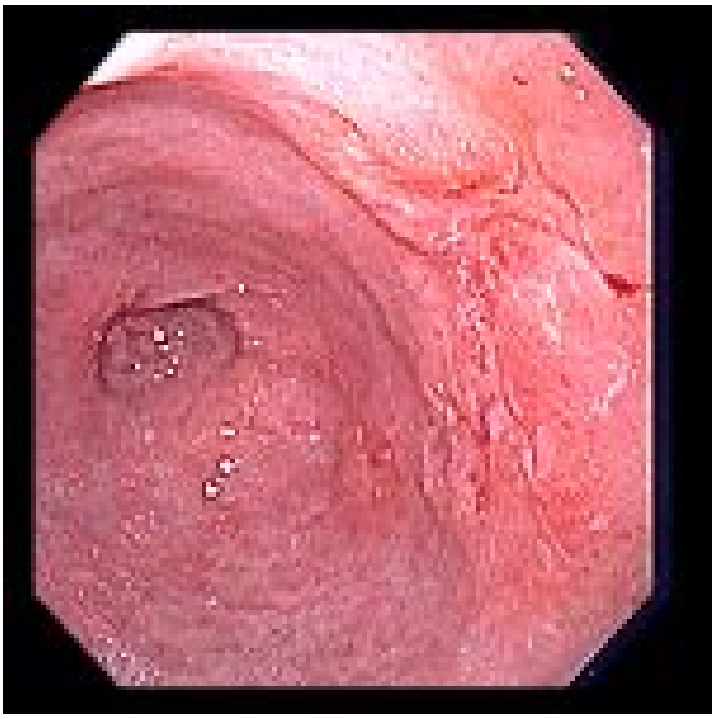
LYMPHATIC DRAINAGE OF STOMACH

ENDOSCOPIC ULTRA SOUND
NORMAL LAYERS



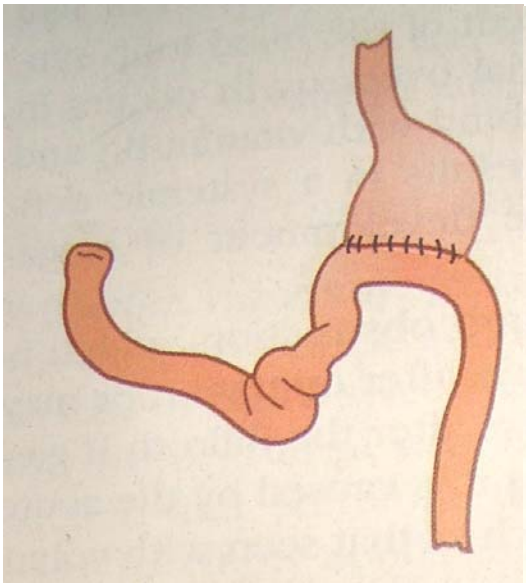
ENDOSCOPY

ANTRAL GROWTH

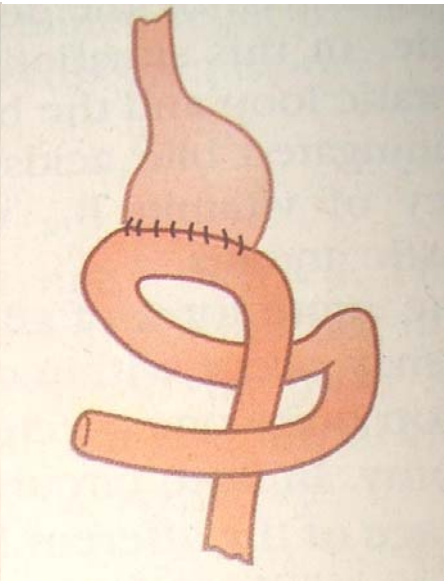


EARLY GASTRIC CANCER

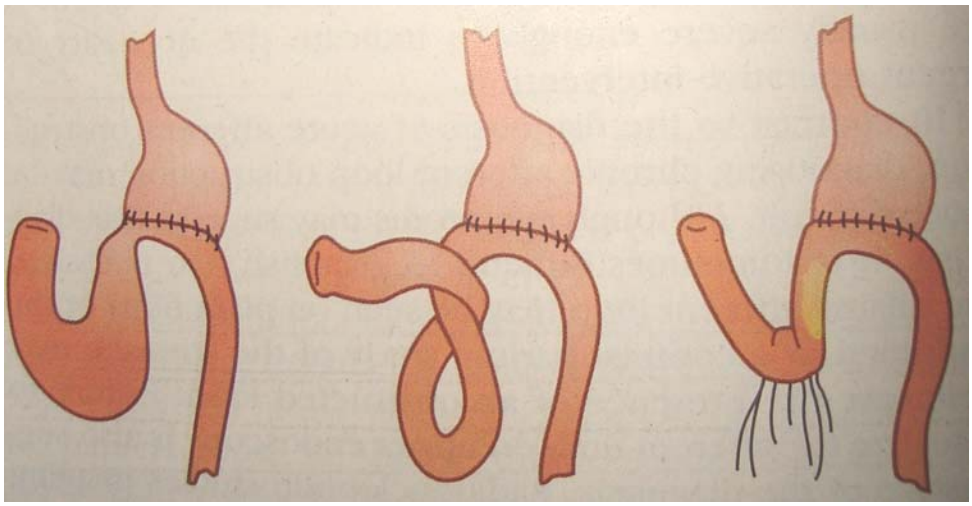
CAUSES OF AFFERENT LOOP OBSTRUCTION



Kinking and angulation



Internal herniation behind efferent limb

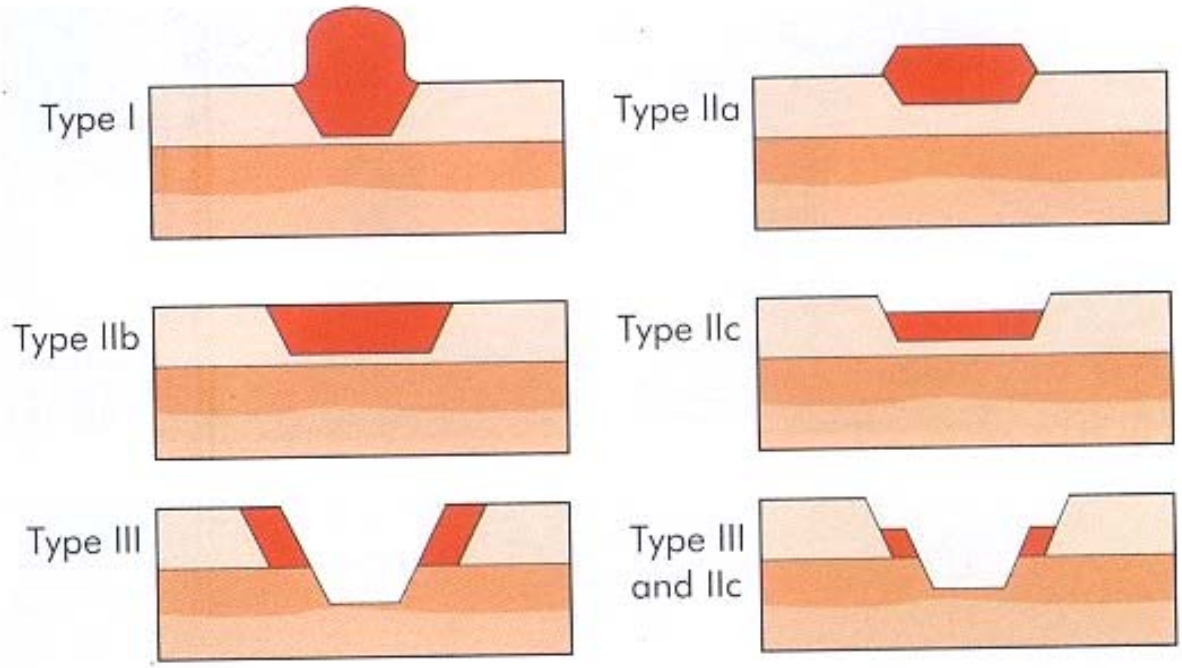


Stenosis Of Gastrojejunal Anastomosis

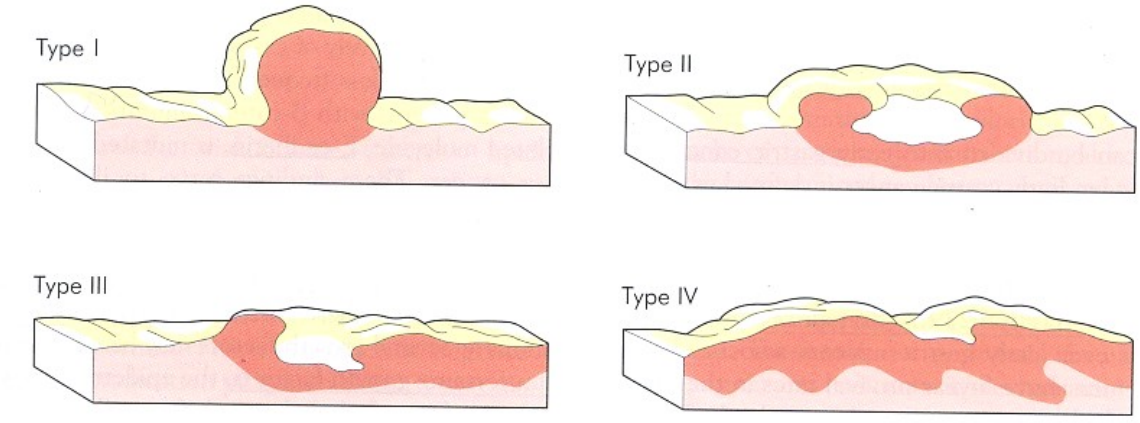
Redudant Twisted Afferent Limb (Volvulus)

Adhesions Involving Afferent Limb

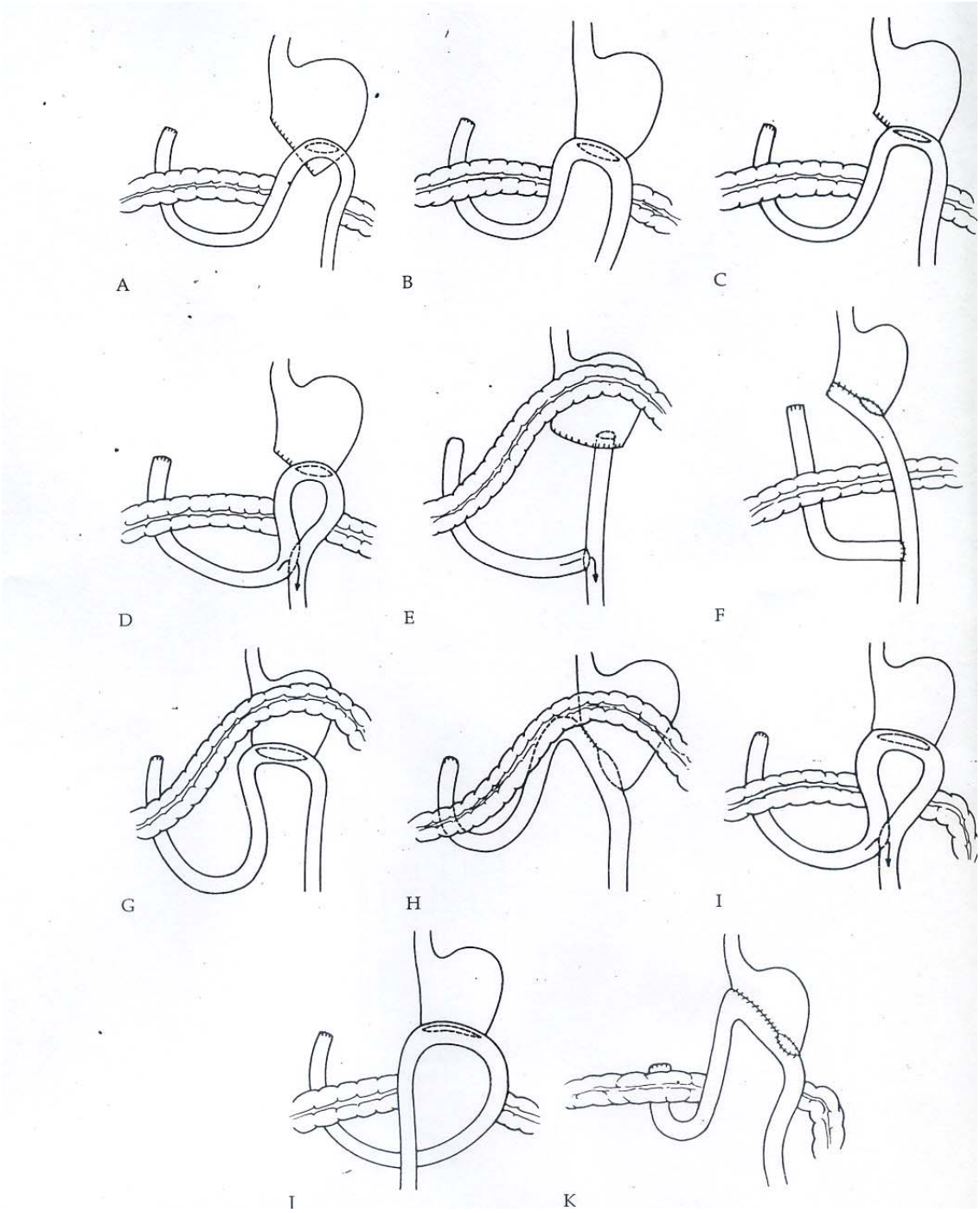
EARLY GASTRIC CANCER



BORRMANN CLASSIFICATION



BILLROTH II MODIFICATOINS



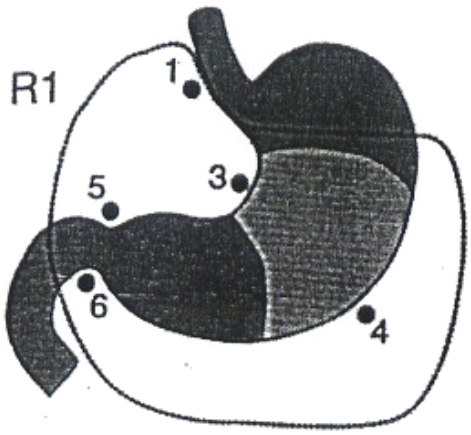
A. Billroth II (1889) **B. Kronlein (1887)** **C. Von – Eiselberg**

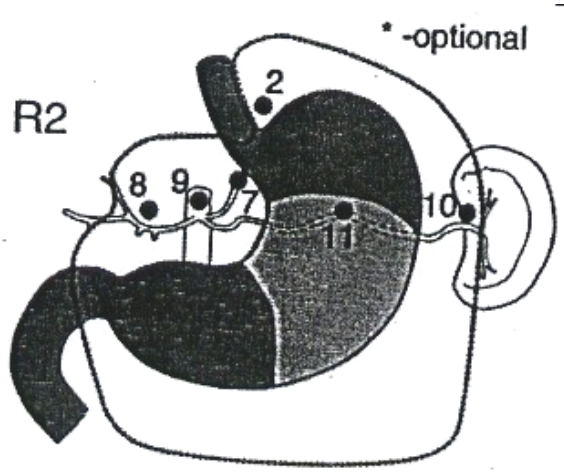
D. Braun **E. Roux** **F. Roux en Y**

G. Reichel polea **H. Fisterer- Hofmeister** **I. Balfour**

J.Moynihan **K.Tanner**

EXTENT OF GASTRIC AND LYMPH NODE RESECTION MIDDLE ONE THIRD LESIONS

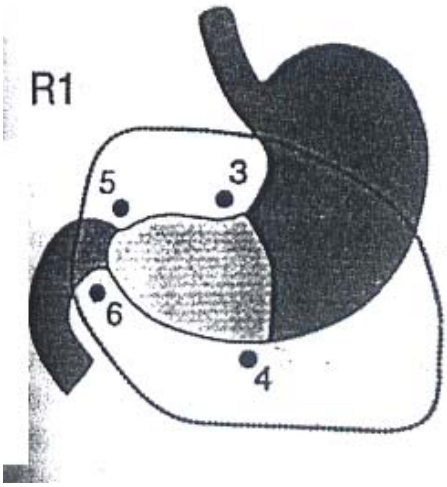


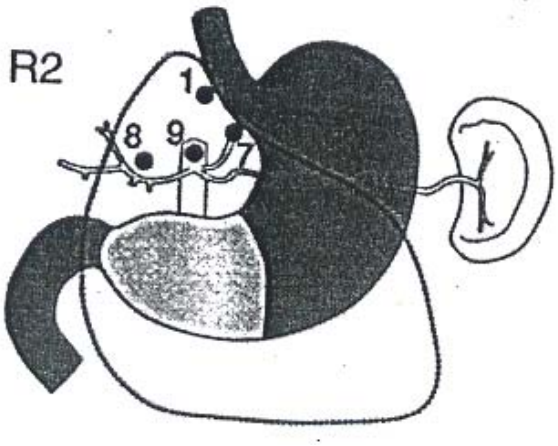


1. **Rt Paracardial**
3. **Lesser curvature**
4. **Greater curvature**
5. **Suprapyloric**
6. **Infrapyloric**

2. Left paracardoial
7. Left gastric
8. Hepatic
9. Celiac
10.Splenic hilar
11. Splenic

LOWER ONE- THIRD LESION





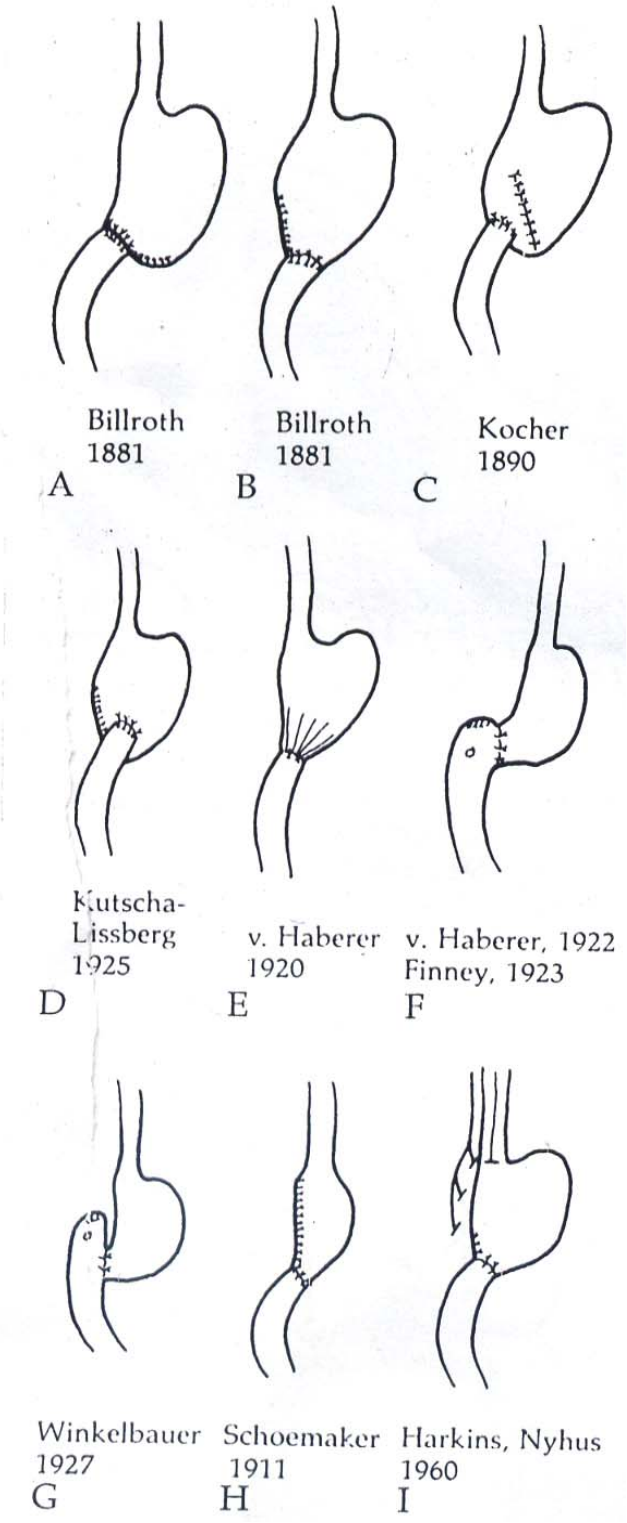
3. Lesses curvature
4. Greater curevature

1.Rt Paracardial
7. Left gastric

5. Suprapyloric
6. Infrapyloric

8.Hepatic
9.Celiac

MODIFICATIONS OF THE BILLROTH 1 RESECTION



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